Technical Note

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NOVA SCOTIA
Environment and Labour
Environmental and Natural Areas Management Division
Protected Areas Branch

Research Topics for Protected Areas in Nova Scotia

Introduction

Nova Scotia Environment and Labour manages two types of protected areas: Wilderness Areas and Nature Reserves. Wilderness Areas protect representative examples of different natural ecosystems and outstanding natural features while providing opportunities for research, wilderness recreation, sportfishing, and traditional patterns of hunting and trapping. Nature Reserves protect specific rare or special species, habitats or ecosystems, and provide areas for research, education, and nature appreciation.

This document provides students with suggestions for topics for papers or research. Many of the topics came from a workshop on research in protected areas held by Protected Areas Branch (PAB) planners in January 2003. *Literature Searches and Subjects of Interest* are suggestions for class papers or undergraduate theses. *Short Term Studies* can be used for undergraduate theses or graduate level class papers. *Long Term Studies* are for graduate level research. Investigation of any of these topics will aid in the management of Nova Scotia's Wilderness Areas and Nature Reserves.

The PAB Ecologist is available to meet with students wishing to pursue any topics related to protected areas or conservation ecology. Research that involves data collection within a Wilderness Area or Nature Reserve requires a research licence, available from the PAB Ecologist.

Literature Searches and Subjects of Interest

1. Ecological impacts of motorized recreational vehicles
2. Recreational impacts on different ecosystems
3. Focal, keystone and umbrella species that can be used in protected areas planning
4. Connections between human health and protected areas
5. Potential impacts of wood preservative treatments for structures in protected areas
6. Invasive alien species of greatest concern in eastern North America and controls for protected areas
7. Barren ecology
8. Landscape connectivity and protected areas
9. Fragmentation and isolation of habitat in protected areas
10. Conservation of genetic diversity
11. Social and economic benefits of protected areas
12. Effective ways of encouraging low impact recreational use of protected areas
13. Outfitter guidelines/best management practices in protected areas

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Short Term Studies - Data Available from Protected Areas Branch

1. What abiotic variables affect distribution of biota at a landscape level? Remote sensed data in GIS format can be used to correlate tree species distribution with abiotic variables such as topography, soil drainage, soil texture, surficial geology, bedrock geology, climate and others. The results would help PAB define ecosystems at a landscape scale to assess representation for protection of ecosystem diversity.

2. How much has ATV use/disturbance increased in Wilderness Areas in the last ten years and how much area is affected? ATV trails are clearly visible in many habitat types on colour aerial photographs at a scale of 1:10,000. Photos from the early 90's can be compared to photos from 2000 to 2002 to determine the increase in number and length of trails.

3. What is the amount of watershed protection in different protected areas? Some watersheds are contained completely within a protected area while other watersheds are only partially protected. Identifying the amount of watershed area protected can help assess ecological integrity of protected areas as well as assess the contribution of protected areas to aquatic conservation.

4. Ecosystem classification: What plant communities occur in the various Ecosystem Types in protected areas? Plant communities are fine scale of the PAB ecosystem classification system and have recently been described for the Maritime forests. Field data from past transects can be used to determine which plant communities occur within protected areas by Ecosystem Type (coarse scale). This will help PAB better determine biodiversity of different ecosystems.

5. Succession in the Shelburne Barrens: Historical aerial photography can be compared to current photography to determine rate and type of succession occurring in different barren types.

6. What is the representation of wetland types within protected areas in Nova Scotia? All freshwater wetlands in Nova Scotia have been classified using aerial photography and digitized for use in GIS. A relatively simple GIS exercise to assess wetland representation could be done by summarizing wetland types by Natural Landscape and then determining the area of each type within protected areas.

7. How much mature forest cover is required to maintain interior forest bird species? GIS forest cover data and the Breeding Bird Atlas can be used to correlate amount of forest cover with interior bird species presence.

8. How much carbon is stored in Nova Scotia's protected areas? Standard conversions for biomass to tonnes of carbon can be used with GIS forest cover data and wetland data to determine the total amount of carbon stored in protected areas.

9. What breeding bird species occur in protected areas? The Breeding Bird Atlas can be overlaid on protected areas boundaries to determine which bird species have been found in protected areas.

10. Historical settlement inventory for protected areas: Aerial photographs and historical records can be searched for evidence of past human settlement. These areas can be located on maps and digitized as a GIS layer.

Long Term Studies of Interest to Protected Areas Branch

1. What is the representation of different Ecosystem Types of protected riparian, fluvial and aquatic habitats and where should future protection be directed? Fluvial and aquatic habitats first need to be classified by standardized and accepted systems. The amount of each different type of habitat could be determined for each Natural Landscape and then determined for each protected area occurring in that Natural Landscape. Fluvial and aquatic Ecosystem Types not protected can then be targeted for protection.

2. What is the role of ice/winter storm disturbance in the structure and ecology of northern tolerant hardwoods? In 2002, the Cobequid Hills received extensive tree damage from an ice storm. Residents of the area suggest this is not uncommon. In many cases, trees survive the damage but have severely reduced growth rates. The frequency and severity of storms can be determined by a dendrocological study of tree rings. The dendrocological results could be correlated with current forest structure to help define how ice storms affect these ecosystems.

3. What is the role of fire as a natural disturbance in Nova Scotia? Bog or lake sediments can be cored to search for charcoal from past wildfires. Frequency of fires for the past millennium could then be estimated based on depth to charcoal. A complementary study could include developing fire hazard mapping for Nova Scotia using standardized Canadian Fire Weather Rating System and comparing Nova Scotia hazard ratings to known natural fire ecosystems.

4. What is the structure and pattern of wind disturbance in Nova Scotia's forests? Waverley-Salmon River and White Lake Wilderness Areas represent the largest areas of forest undisturbed by humans within the track of Hurricane Juan. These Wilderness Areas provide the best opportunity to learn about how natural disturbances affect natural forest ecosystems. Transects could be run through these areas to measure hurricane effects on trees (e.g. tip-ups vs. breaking stems, tree species), opening size, frequency of opening by size class and disturbance severity by forest type. Characterizing natural disturbance patterns helps in understand succession and its role in the natural biodiversity of forests.

5. Do trails and/or roads act as corridors for invasive exotic plant species in protected areas? Plots at increasing distances from trails and roads in protected areas could be surveyed for exotic species. Another approach would be to compare results of exotic plant surveys in protected areas with high road density to protected areas with low or zero road density.

6. What are the effects of adjacent landuse on protected areas? How much and what kind of buffers are needed around protected areas to reduce impacts of adjacent landuse? Adjacent landuse can impact protected areas in many ways including facilitating dispersal of exotic invasive species, silting and contaminating streams and reducing interior habitat. Managers need to know what activities are of greatest concern and what mitigative measures and/or buffers are needed.

7. Are adjacent landuse practices isolating habitat within protected areas? Protected areas planners need to know which areas are being isolated, for what organisms or ecosystem functions and what adjacent landuse practices cause the most isolation.

8. What is the role of protected areas in maintaining rare/endangered species? Which species require habitat to be protected in order to survive and where do they occur? Is there currently adequate protection of their habitat in protected areas to maintain the species?

9. What is the genetic diversity of eastern hemlock and what are the effects of forest practices? Some ecologists have suggested that eastern hemlock was once more frequent in Nova Scotia than it is now. Forestry practices have lead to reduced frequency and possibly isolation of populations. There is concern that genetic variability has been reduced.

10. An ecologically based system for classifying lakes in Nova Scotia is needed to help determine how many lake Ecosystem Types are protected.

11. How much area in old growth forest is needed to maintain old growth species? Another way to ask this question is: what is the minimum viable habitat needed to maintain old growth species in Nova Scotia?

12. Which organisms are being affected by heavy metal contamination and how are they being affected? Heavy metals such as mercury and cadmium are being found in organisms in south-western Nova Scotia. Transboundary pollution is being blamed, but it is uncertain whether the metals are being transported from central North American or whether acid deposition is causing release of naturally occurring elements.

13. What species and ecosystems are most likely to be affected by climate change and what mitigative measures are needed to maintain biodiversity in protected areas?

14. What is the affect of ground level ozone on sensitive species in southwestern Nova Scotia? High ozone levels are being detected in southwest Nova Scotia. How is ozone affecting organisms? Which organisms are most susceptible?

15. How much carbon is sequestered in protected areas in Nova Scotia? Maintaining protected areas has been cited as a positive step toward reducing carbon in the atmosphere. Modeling is one approach that can be used to examine carbon sequestration over time.

16. How does the presence of protected areas affect ecological integrity of landscapes? Indices of landscape level ecological integrity could be calculated for landscapes with and without existing protected areas.

17. Where and what are the natural corridors in Nova Scotia? Topographic, hydrological, weather, climate and vegetation data can be used to map natural flows of energy and matter across the landscape. Key areas for connectivity can often be identified and integrated into landuse planning.

18. What factors most influence barren ecology in Nova Scotia? Several factors have been proposed including bedrock exposure, coastal exposure, high elevation and fire. Little data has been collected to document the importance of these factors in different barren types.

19. Do low productivity ecosystems such as bogs and barrens recover from ATV use and if so what is the recovery rate? There is a significant amount of area in bog and barren which has been heavily impacted by ATV use. It is uncertain whether these areas will fully recover on their own or whether restoration work is required.

20. How much recreation activity can different ecosystem types sustain before exhibiting ecological impact?

21. What is the amount of motorboat use in Wilderness Areas? What are the environmental impacts of motorboat use? Does motorboat use in Wilderness Areas affect intensity of angling?

22. What is the amount of hunting and trapping occurring in Wilderness Areas? What animals and how many are being taken and what are the implications for species sustainability?

23. What are the historical uses of Wilderness Areas? Archeological investigations of historical aboriginal use areas and European settlements within Wilderness Areas could be conducted.

24. What are the traditional uses of Wilderness Areas? Interviews with senior community members and examination of historical documents could be used to document past use.

25. What are the socio-economic impacts of Wilderness Areas on communities?

26. What are the benefits of Wilderness Areas to communities? How are Wilderness Areas used by communities? Interviews with local members of the community could be done to investigate uses and benefits.

27. What are effective methods of public participation and consensus building for managing Wilderness Areas?

28. What are the recreational and tourism potentials for Wilderness Areas and how can they be developed?

29. How many guides and outfitters work in Wilderness Areas and what services do they offer?

30. How and where have Nova Scotia's Wilderness Areas been portrayed in art and literature and what impact does this have on public perception and attitude towards protected areas?

31. What are traditional recreational corridors and how can they be managed outside protected areas? For example, traditional canoe routes in southwestern Nova Scotia pass through lands under various ownership such as protected areas, Crown lands and private lands.

32. What is the satisfaction of trail users in Wilderness Areas?

33. Any studies that describe genetic characteristics of species or ecosystems, or document cultural features of Wilderness Areas or Nature Reserves.

Data Sets Available

Remote Data:

- Aerial photographs ranging from 1965 to 2002, Landsat and infrared images
- Geographical Information System data on forest cover, elevation, roads, wetlands, lakes and rivers, Significant Old and Unique Forests, Sites of Ecological Significance, small patch ecosystems and ecosystem classification

Field Data:

- Lake survey data for 32 lakes in 14 Wilderness Areas
- Old growth field data for 47 stands in 9 Wilderness Areas
- Species inventories including vascular plants, lichens, birds and insects for various areas
- Ecosystem transects of dominant vegetation and physical features for 26 Wilderness Areas
- Continuous water quality monitoring for Margaree and Shelburne Rivers

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For more information on Nova Scotia's protected areas:
www.gov.ns.ca/enla/pareas/index.htm.